Oecologia

In Cooperation with the
International Association for Ecology (Intecol)

Vol. 73 1987

Editors in Chief

H. Remmert (Zoology) and E.-D. Schulze (Botany)

Editorial Board

F.A. Bazzaz, Cambridge
A. Bertsch, Marburg
P.J. den Boer, Wijster (Dr.)
M.M. Caldwell, Logan
T. Case, La Jolla
F.S. Chapin III, Fairbanks
J. Ehleringer, Salt Lake City
M. Evenari, Jerusalem
J.L. Harper, Bangor
M.P. Hassell, Ascot Berkshire
G.J. Kenagy, Seattle
C.J. Krebs, Vancouver
O.L. Lange, Würzburg
W. Larcher, Innsbruck
J.T. Lehman, Ann Arbor
J. Lubchenco, Corvallis
R.N. Mack, Pullman
P. Miles, Glen Osmond
D. Neumann, Köln
J.S. Pate, Nedlands
R.W. Pearcy, Davis
J. Phillipson, Oxford
M. Schaefer, Göttingen
Th.W. Schoener, Davis
Sir Richard Southwood, Oxford
N.C. Turner, Wembley
A. Watkinson, Norwich
T.C.R. White, Glen Osmond
W. Wieser, Innsbruck
H. Ziegler, München
H. Zwölfer, Bayreuth

Springer International

Oecologia

Derived from *"Zeitschrift für Morphologie und Ökologie der Tiere"*, *Oecologia* was founded in 1968, Volumes (1968–1982), and edited by H. Remmert. As of Volume 53 (1982) the journal has been edited by both H. Remmert and E.-D. Schulze.

Submission of a manuscript implies: that the work described has not been published before (except in the form of an abstract or as part of a published lecture, review, or thesis); that it is not under consideration for publication elsewhere; that its publication has been approved by all coauthors, if any, as well as by the responsible authorities at the institute where the work has been carried out; that, if and when the manuscript is accepted for publication, the authors agree to automatic transfer of the copyright to the publisher; and that the manuscript will not be published elsewhere in any language without the consent of the copyright holders.

All articles published in this journal are protected by copyright, which covers the exclusive rights to reproduce and distribute the article (e.g., as offprints), as well as all translation rights. No material published in this journal may be reproduced photographically or stored on microfilm, in electronic data bases, video disks, etc., without first obtaining written permission from the publisher.

The use of general descriptive names, trade names, trademarks, etc., in this publication, even if not specifically identified, does not imply that these names are not protected by the relevant laws and regulations.

While the advice and information in this journal is believed to be true and accurate at the date of its going to press, neither the authors, the editors, nor the publisher can accept any legal responsibility for any errors or omissions that may be made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

Special regulations for photocopies in the USA: Photocopies may be made for personal or in-house use beyond the limitations stipulated under Section 107 or 108 of U.S. Copyright Law, provided a fee is paid. This fee is US $0.20 per page, or a minimum of US $1.00 if an article contains fewer than five pages. All fees should be paid to the Copyright Clearance Center, Inc., 21 Congress Street, Salem, MA 01970, USA, stating the ISSN 0029-8549, the volume, and the first and last page numbers of each article copied. The copyright owner's consent does not include copying for general distribution, promotion, new works, or resale. In these cases, specific written permission must first be obtained from the publisher.

Other regulations: Authors publishing in this journal can, under certain conditions, benefit from library and photocopy fees collected by VG WORT. Authors resident in the Federal Republic of Germany or in West Berlin can apply to Verwertungsgesellschaft WORT, Abteilung Wissenschaft, Goethestraße 49, D-8000 München 2, for detailed information.

Printers: Universitätsdruckerei H. Stürtz AG, Würzburg
© Springer-Verlag Berlin Heidelberg 1987

Contents

Abrams, P.A.: On classifying interactions between populations 272
Ackerman, J.D., → Roubik, D.W. 321
Ait Lhaj Loutfi, A., → Lumaret, R., et al. 436
Allainé, D., Pontier, D., Gaillard, J.M., Lebreton, J.D., Trouvilliez, J., Clobert, J.: The relationship between fecundity and adult body weight in Homeotherms 478
Amory, A.M., Schubert, C.L.: A method to determine tannin concentration by the measurement and quantification of protein – tannin interactions 420
Anderson, L.C., → Stiling, P.D., et al. 116
Andrews, R.M., Pough, F.H., Collazo, A., Queiroz, A. de: The ecological cost of morphological specialization: feeding by a fossorial lizard 139
Antolin, M.F., Strong, D.R.: Long-distance dispersal by a parasitoid (*Anagrus delicatus*, Mymaridae) and its host 288
Back, H., → Dallinger, R., et al. 91
Baia, K.A., → M'Closkey, R.T., et al. 28
Barbosa, P., → Morrison, G. 609
Beattie, A.J., → Peakall, R., et al. 522
Becker, G.: Net-building behaviour, tolerance and development of two caddisfly species from the river Rhine (*Hydropsyche contubernalis* and *H. pellucidula*) in relation to the oxygen content 242
Berish, C.W., → Potter, C.S., et al. 268
Black, R., Peterson, C.H.: Biological vs. physical explanations for the non-random pattern of host occupation by a macroalga attaching to infaunal bivalve molluscs . . 213
Borner, M., Fitzgibbon, C.D., Borner, Mo., Caro, T.M., Lindsay, W.K., Collins, D.A., Holt, M.E.: The decline of the Serengeti Thomson's gazelle population 32
Borner, Mo., → Borner, M., et al. 32
Braun, B., → Reznick, D.N. 401
Bruggink, M., → Heil, G.W. 105
Bryant, J.P., Clausen, T.P., Reichardt, P.B., McCarthy, M.C., Werner, R.A.: Effect of nitrogen fertilization upon the secondary chemistry and nutritional value of quaking aspen (*Populus tremuloides* Michx.) leaves for the large aspen tortrix (*Choristoneura conflictana* (Walker)) 513
Buchsbaum, R., Valiela, I.: Variability in the chemistry of estuarine plants and its effect on feeding by Canada geese 146
Burdon, J.J.: Phenotypic and genetic patterns of resistance to the pathogen *Phakopsora pachyrhizi* in populations of *Glycine canescens* 257
Burgess, R.S.L., Ennos, R.A.: Selective grazing of acyanogenic white clover: Variation in behaviour among populations of the slug *Deroceras reticulatum* 432
Busby, W.H., → Feinsinger, P. 231
Caldwell, M.M., → Richards, J.H. 486
Carey, J.R., → Krainacker, D.A., et al. 583
Caro, T.M., → Borner, M., et al. 32
Carver, K.A., → Earnshaw, M.J., et al. 566
Cates, R.G., Henderson, C.B., Redak, R.A.: Responses of the western spruce budworm to varying levels of nitrogen and terpenes 312
Chazdon, R.L., Field, C.B.: Determinants of photosynthetic capacity in six rainforest *Piper* species 222
Chazdon, R.L., Field, C.B.: Photographic estimation of photosynthetically active radiation: evaluation of a computerized technique 525
Cheplick, G.P., Quinn, J.A.: The role of seed depth, litter, and fire in the seedling establishment of amphicarpic peanutgrass (*Amphicarpum purshii*) 459
Clausen, T.P., → Bryant, J.P., et al. 513
Clay, K.: Effects of fungal endophytes on the seed and seedling biology of *Lolium perenne* and *Festuca arundinacea* 358
Clobert, J., → Allainé, D., et al. 478
Collazo, A., → Andrews, R.M., et al. 139
Collins, D.A., → Borner, M., et al. 32
Coxson, D.S.: The temperature dependance of photoinhibition in the tropical basidiomycete lichen *Cora pavonia* E. Fries 447
Coxson, D.S.: Net photosynthetic response patterns of the basidiomycete lichen *Cora pavonia* (Web.) E. Fries from the tropical volcano La Soufrière (Guadeloupe) 454
Cribb, P.J., → Earnshaw, M.J., et al. 566
Croft, J.R., → Earnshaw, M.J., et al. 566
Cruttwell, N.E.G., → Earnshaw, M.J., et al. 566
Czygan, F.-C., → Lange, O.L., et al. 351
Dallinger, R., Prosi, F., Segner, H., Back, H.: Contaminated food and uptake of heavy metals by fish: a review and a proposal for further research 91
Danell, K., Hörnfeldt, B.: Numerical responses by populations of red fox and mountain hare during an outbreak of sarcoptic mange 533
Dearing, M.D., → Schall, J.J. 389
Delay, J., → Lumaret, R., et al. 436
Dobson, F.S., → Murie, J.O. 1
Earnshaw, M.J., Winter, K., Ziegler, H., Stichler, W., Cruttwell, N.E.G., Kerenga, K., Cribb, P.J., Wood, J., Croft, J.R., Carver, K.A., Gunn, T.C.: Altitudinal changes in the incidence of crassulacean acid metabolism in vascular epiphytes and related life forms in Papua New Guinea 566
Eirefelt, S., → Karlsson, P.S., et al. 518
Eloranta, P., → Kankaala, P. 203
Elstner, E.F., Fink, R., Höll, W., Lengfelder, E., Ziegler, H.: Natural and Chernobyl-caused radioactivity in mushrooms, mosses and soil-samples of defined biotops in SW Bavaria 553
Ennos, R.A., → Burgess, R.S.L. 432
Farrar, R.R., → Kennedy, G.G., et al. 615
Feinsinger, P., Busby, W.H.: Pollen carryover: experimental comparisons between morphs of *Palicourea lasiorrachis* (Rubiaceae), a distylous, bird-pollinated, tropical treelet 231
Feminella, J.W., → Lamberti, G.A., et al. 75
Field, C.B., → Chazdon, R.L. 222, 525
Fink, Rita., → Elstner, E.F., et al. 553
Fitzgibbon, C.D., → Borner, M., et al. 32
Ford, N.B., → Seigel, R.A., et al. 481
Forno, I.W., Semple, J.L.: Response of *Salvinia molesta* to insect damage: changes in nitrogen, phosphorus and potassium content 71
Forrest, T.G.: Insect size tactics and developmental strategies 178
Freeman, M.C., → Grossman, G.D., et al. 490, 501
Fricke, H.W., Vareschi, E., Schlichter, D.: Photoecology of the coral *Leptoseris fragilis* in the Red Sea twilight zone (an experimental study by submersible) 371
Fritz, R.S., Gaud, W.S., Sacchi, C.F., Price, P.W.: Patterns of intra- and interspecific association of gall-forming sawflies in relation to shoot size on their willow host plant 159
Gaillard, J.M., → Allainé, D., et al. 478
Gaud, W.S., → Fritz, R.S., et al. 159
Gebel, J., → Lange, O.L., et al. 351
Giguère, L.A., Northcote, T.G.: Ingested prey increase risks of visual predation in transparent *Chaoborus* larvae . . 48
Gilpin, M.E., → Ryti, R.T. 282
Goldingay, R.L.: Sap feeding by the marsupial *Petaurus australis*; an enigmatic behaviour? 154
Goldsmith, S.K.: Resource distribution and its effect on the mating system of a longhorned beetle, *Perarthrus linsleyi* (Coleoptera: Cerambycidae) 317
Gross, K.L., → Kromer, M. 207
Grossman, G.D., Sostoa, A. de, Freeman, M.C., Lobon-Cerviá, J.: Microhabitat use in a mediterranean riverine fish assemblage. Fishes of the lower Matarraña 490

Grossman, G.D., Sostoa, A. de, Freeman, M.C., Lobon-Cerviá, J.: Microhabitat use in a mediterranean riverine fish assemblage. Fishes of the upper Matarraña 501
Guillerm, J.-L., → Lumaret, R., et al. 436
Gunn, T.C., → Earnshaw, M.J., et al. 566
Hadley, J.L., Smith, W.K.: Influence of krummholz mat microclimate on needle physiology and survival 82
Hadley, N.F., → Schultz, T.D. 363
Hanks, R.J., → Wraith, J.M., et al. 573
Hart, D.D.: Experimental studies of exploitative competition in a grazing stream insect 41
Heil, G.W., Bruggink, M.: Competition for nutrients between *Calluna vulgaris* (L.) Hull and *Molinia caerulea* (L.) Moench 105
Heilmeier, H., Whale, D.M.: Carbon dioxide assimilation in the flowerhead of *Arctium* 109
Henderson, C.B., → Cates, R.G., et al. 312
Hershey, A.E.: Tubes and foraging behavior in larval Chironomidae: implications for predator avoidance 236
Higgins, S.S., Mack, R.N.: Comparative response of *Achillea millefolium* ecotypes to competition and soil type: . . . 591
Höll, W., → Elstner, E.F., et al. 553
Hörnfeldt, B., → Danell, K. 533
Hövemeyer, K.: The population dynamics of *Cheilosia fasciata* (Diptera, Syrphidae): significance of environmental factors and behavioural adaptations in a phytophagous insect 537
Holt, M.E., → Borner, M., et al. 32
Howe, H.F., → Wright, S.J. 543
Huggins, M.M., → Seigel, R.A., et al. 481
Humphrey, J.A.C.: Fluid mechanic constraints on spider ballooning 469
Hutchings, M.J., → Slade, A.J. 425
Izco, J., → Lumaret, R., et al. 436
James, S.H., → Peakall, R., et al. 522
Jay, M., → Lumaret, R., et al. 436
Johansson, L.: Experimental evidence for interactive habitat segregation between roach (*Rutilus rutilus*) and rudd (*Scardinius erythrophthalmus*) in a shallow eutrophic lake 21
Johnson, D.A., → Wraith, J.M., et al. 573
Joint, I.R., → Warwick, R.M. 185
Jones, S.M., Waldschmidt, S.R., Potvin, M.A.: An experimental manipulation of food and water: growth and time-space utilization of hatchling lizards (*Sceloporus undulatus*) 53
Kankaala, P., Eloranta, P.: Epizooic ciliates (*Vorticella* sp.) complete for food with their host *Daphnia longispina* in a small polyhumic lake 203
Karban, R.: Environmental conditions affecting the strength of induced resistance against mites in cotton 414
Karlsson, P.S., Nordell, K.O., Eirefelt, S., Svensson, A.: Trapping efficiency of three carnivorous *Pinguicula* species 518
Kennedy, G.G., Farrar, R.R., Riskallah, M.R.: Induced tolerance of neonate *Heliothis zea* to host plant allelochemicals and carbaryl following incubation of eggs on foliage of *Lycopersicon hirsutum* f. *glabratum* 615
Kerenga, K., → Earnshaw, M.J., et al. 566
Kingsolver, J.G.: Predation, thermoregulation, and wing color in pierid butterflies 301
Köstner, B., → Lange, O.L., et al. 351
Kozár, F.: The probability of interspecific competitive situations in scale-insects (Homoptera, Coccoidea) 99
Krainacker, D.A., Carey, J.R., Vargas, R.I.: Effect of larval host on life history traits of the mediterranean fruit fly, *Ceratitis capitata* 583
Kramer, D.L., → Wolf, N.G. 127
Kromer, M., Gross, K.L.: Seed mass, genotype, and density effects on growth and yield of *Oenothera biennis* L. . . 207
Kusuoka, Y., Watanabe, Y.: Growth and survival of peritrich ciliates in an urban stream 16
Lamberti, G.A., Feminella, J.W., Resh, V.H.: Herbivory and intraspecific competition in a stream caddisfly population 75
Lange, O.L., Zellner, H., Gebel, J., Schramel, P., Köstner, B., Czygan, F.-C.: Photosynthetic capacity, chloroplast pigments, and mineral content of the previous year's spruce needles with and without the new flush: analysis of the forest-decline phenomenon of needle bleaching 351
Lebreton, J.D., → Allainé, D., et al. 478
Lengfelder, E., → Elstner, E.F., et al. 553
Lindsay, W.K., → Borner, M., et al. 32
Lobon-Cerviá, J., → Grossman, G.D., et al. 490
Lobon-Cerviá, J., → Grossman, G.D., et al. 501
Lumaret, R., Guillerm, J.-L., Delay, J., Ait Lhaj Loutfi, A., Izco, J., Jay, M.: Polyploidy and habitat differentiation in *Dactylis glomerata* L. from Galicia (Spain) 436
Mack, R.N., → Higgins, S.S. 591
McCarthy, M.C., → Bryant, J.P., et al. 513
McGraw, J.B.: Experimental ecology of *Dryas octopetala* ecotypes. IV. Fitness response to reciprocal transplanting in ecotypes with differing plasticity 465
M'Closkey, R.T., Baia, K.A., Russell, R.W.: Defense of mates: a territory departure rule for male tree lizards following sex-ratio manipulation 28
McNeil, J.N., → Quiring, D.T. 7
Melampy, M.N.: Flowering phenology, pollen flow and fruit production in the andean shrub *Befaria resinosa* 293
Moore, P.G., Rainbow, P.S.: Copper and zinc in an ecological series of talitroidean Amphipoda (Crustacea) . . . 120
Morgan, S.G.: Morphological and behavioral antipredatory adaptations of decapod zoeae 393
Morrison, G., Barbosa, P.: Spatial heterogeneity, population "regulation" and local extinction in simulated host-parasitoid interactions 609
Moss, R., Watson, A.: Changes in the down colour of chicks during a population decline in red grouse 598
Murie, J.O., Dobson, F.S.: The costs of reproduction in female columbian ground squirrels 1
Nordell, K.O., → Karlsson, P.S., et al. 518
Northcote, T.G., → Giguère, L.A. 48
Peakall, R., Beattie, A.J., James, S.H.: Pseudocopulation of an orchid by male ants: a test of two hypotheses accounting for the rarity of ant pollination 522
Persson, L.: Effects of habitat and season on competitive interactions between roach (*Rutilus rutilus*) and perch (*Perca fluviatilis*) 170
Peterson, C.H., → Black, R. 213
Pontier, D., → Allainé, D., et al. 478
Potter, C.S., Ragsdale, H.L., Berish, C.W.: Resorption of foliar nutrients in a regenerating southern Appalachian forest 268
Potvin, M.A., → Jones, S.M., et al. 53
Pough, F.H., → Andrews, R.M., et al. 139
Price, P.W., Roininen, H., Tahvanainen, J.: Plant age and attack by the bud galler, *Euura mucronata* 334
Price, P.W., → Fritz, R.S., et al. 159
Prosi, F., → Dallinger, R., et al. 91
Pschorn-Walcher, H.: Interspecific competition between the principal larval parasitoids of the pine sawfly, *Neodiprion sertifer* (Geoff.) (Hym.: Diprionidae) 621
Queiroz, A. de, → Andrews, R.M., et al. 139
Quinn, J.A., → Cheplick, G.P. 459
Quiring, D.T., McNeil, J.N.: Foraging behavior of a Dipteran leaf miner on exploited and unexploited hosts 7
Ragsdale, H.L., → Potter, C.S., et al. 268
Rainbow, P.S., → Moore, P.G. 120
Rasmussen, J.B.: The effect of a predatory leech, *Nephelopsis obscura*, on mortality, growth, and production of chironomid larvae in a small pond 133
Redak, R.A., → Cates, R.G., et al. 312
Reichardt, P.B., → Bryant, J.P., et al. 513
Reid, W., → Schoenly, K. 192
Resh, V.H., → Lamberti, G.A., et al. 75

Reznick, D.N., Braun, B.: Fat cycling in the mosquitofish (*Gambusia affinis*): fat storage as a reproductive adaptation 401
Richards, J.H., Caldwell, M.M.: Hydraulic lift: Substantial nocturnal water transport between soil layers by *Artemisia tridentata* roots 486
Riskallah, M.R., → Kennedy, G.G., et al. 615
Robertson, H.G.: Oviposition site selection in *Cactoblastis cactorum* (Lepidoptera): constraints and compromises 601
Roininen, H., → Price, P.W., et al. 334
Rotenberry, J.T., → Wiens, J.A., et al. 60
Roubik, D.W., Ackerman, J.D.: Long-term ecology of euglossine orchid-bees (Apidae: Euglossini) in Panama . . 321
Russell, R.W., → M'Closkey, R.T., et al. 28
Ryti, R.T., Gilpin, M.E.: The comparative analysis of species occurrence patterns on archipelagos 282
Sacchi, C.F., → Fritz, R.S., et al. 159
Saitoh, T.: A time series and geographical analysis of population dynamics of the red-backed vole in Hokkaido, Japan 382
Schall, J.J., Dearing, M.D.: Malarial parasitism and male competition for mates in the western fence lizard, *Sceloporus occidentalis* 389
Schlichter, D., → Fricke, H.W., et al. 371
Schoenly, K., Reid, W.: Dynamics of heterotrophic succession in carrion arthropod assemblages: discrete seres or a continuum of change? 192
Schramel, P., → Lange, O.L., et al. 351
Schubert, C.L., → Amory, A.M. 420
Schultz, T.D., Hadley, N.F.: Microhabitat segregation and physiological differences in co-occurring tiger beetle species, *Cicindela oregona* and *Cicindela tranguebarica* . . . 363
Segner, H., → Dallinger, R., et al. 91
Seigel, R.A., Huggins, M.M., Ford, N.B.: Reduction in locomotor ability as a cost of reproduction in gravid snakes 481
Semple, J.L., → Forno, I.W. 71
Simberloff, D., → Stiling, P.D., et al. 116
Sisson, D.V., → Wraith, J.M., et al. 573
Slade, A.J., Hutchings, M.J.: An analysis of the costs and benefits of physiological integration between ramets in the clonal perennial herb *Glechoma hederacea* 425
Smith, W.K., → Hadley, J.L. 82
Sostoa, A. de, → Grossman, G.D., et al. 490, 501
Stichler, W., → Earnshaw, M.J., et al. 566
Stiling, P.D., Simberloff, D., Anderson, L.C.: Non-random distribution patterns of leaf miners on oak trees 116
Strong, D.R., → Antolin, M.F. 288
Svensson, A., → Karlsson, P.S., et al. 518
Tahvanainen, J., → Price, P.W., et al. 334
Tanaka, S., Wolda, H.: Seasonal wing length dimorphism in a tropical seed bug: ecological significance of the short-winged form 559
Toft, C.A.: Population structure and survival in a solitary wasp (*Microbembex cubana*: Hymenoptera, Sphecidae, Nyssoninae) 338
Trouvilliez, J., → Allainé, D., et al. 478
Turpin, D.H., → Williams, T.G. 307
Valiela, I., → Buchsbaum, R. 146
Van Horne, B., → Wiens, J.A., et al. 60
Vareschi, E., → Fricke, H.W., et al. 371
Vargas, R.I., → Krainacker, D.A., et al. 583
Waisel, Y.: Evolution of erect growth forms in domesticated wheats: possible effects of grazing 630
Waldschmidt, S.R., → Jones, S.M., et al. 53
Warwick, R.M., Joint, I.R.: The size distribution of organisms in the Celtic Sea: from bacteria to Metazoa . . . 185
Watanabe, Y., → Kusuoka, Y. 16
Watson, A., → Moss, R. 598
Weider, L.J.: Life history variation among low-arctic clones of obligately parthenogenetic *Daphnia pulex*: a diploid-polyploid complex 251
Werner, R.A., → Bryant, J.P., et al. 513
Whale, D.M., → Heilmeier, H. 109
Wiens, J.A., Van Horne, B., Rotenberry, J.T.: Temporal and spatial variations in the behavior of shrubsteppe birds 60
Williams, T.G., Turpin, D.H.: Photosynthetic kinetics determine the outcome of competition for dissolved inorganic carbon by freshwater microalgae: implications for acidified lakes 307
Wilson, J.B.: Methods for detecting non-randomness in species co-occurrences: a contribution 579
Winter, K., → Earnshaw, M.J., et al. 566
Wolda, H., → Tanaka, S. 559
Wolf, N.G., Kramer, D.L.: Use of cover and the need to breathe: the effects of hypoxia on vulnerability of dwarf gouramis to predatory snakeheads 127
Wood, J., → Earnshaw, M.J., et al. 566
Woodward, B.D.: Paternal effects on offspring traits in *Scaphiopus couchi* (Anura: Pelobatidae) 626
Wraith, J.M., Johnson, D.A., Hanks, R.J., Sisson, D.V.: Soil and plant water relations in a crested wheatgrass pasture: response to spring grazing by cattle 573
Wright, S.J., Howe, H.F.: Pattern and mortality in Colorado Desert plants 543
Zellner, H., → Lange, O.L., et al. 351
Ziegler, H., → Earnshaw, M.J., et al. 566
Ziegler, H., → Elstner, E.F., et al. 553

Index in *Current Contents*